

Chemical Society's Journal. The whole of the circulating system is enclosed, so that it can be immersed completely in a thermostat, the movement of the liquid being controlled by means of a series of taps connected to a suction-pump. The capillary is arranged in a vertical position, but contrary to the usual practice the flow is in an upward direction, so that the risk of partial obstruction of the capillary by particles of dust is greatly diminished. The adjustment of the volume of the flowing liquid is practically automatic and very exact. A special tube with a tap is provided, whereby the liquid to be tested can be drawn from the centre of a stock-bottle after ample time has been allowed for all traces of sediment to settle; this is a marked improvement on pouring the liquid into the viscometer directly or from an ordinary pipette. The new viscometer has been tested during several years of actual practice, and promises to take a permanent place alongside the pyknometer and the stills for conductivity-water, which have already been described by the author.

THE University of Chicago Press has in preparation for early publication in the "University of Chicago Science Series":—"The Origin of the Earth," by Prof. T. C. Chamberlin, and "The Isolation and Measurement of the Electron," by Prof. R. A. Millikan. The volumes will be issued in this country by the Cambridge University Press.

OUR ASTRONOMICAL COLUMN.

COMET 1915c (TAYLOR).—This comet has been under observation a number of times at the Hill Observatory since the beginning of the year. It has slowly increased in brightness. The ephemeris given below (No. 498, Eph. Zir., *Astronomische Nachrichten*) is based on the second orbit calculated by Messrs. Braae and Fischer-Petersen, and is for 12h. M.T. Greenwich:—

Jan.	R.A.	δ	Jan.	R.A.	δ
12	5 2 47	+13 8.0	18	5 2 28	+16 13.9
14	2 30	14 9.1	20	2 44	17 17.2
16	2 24	15 11.1	21	3 13	18 20.9

The R.A.'s increase after January 16. The comet continues to approach the sun. An observation on January 7 showed that the ephemeris then required corrections of +2.7 min. in R.A. and $-43''$ in declination. It may be remarked that it is moving through a region devoid of bright stars—N. and W. of Bellatrix.

We have received the following upon this comet from the Union Observatory, Johannesburg, December 9, 1915:—

On December 2, 1915, Mr. Clement J. Taylor, of Herschel View, near Capetown, reported to the Union Observatory, Johannesburg, he had found a comet in Orion on November 24, and that it was near 31 Orion, and moving northwards. It was observed on the same evening and subsequently. The 1915.0 astrophotographic positions obtained at the Union Observatory are:—

Greenwich Time.

1915			f	m.	s.			
Dec. 2.347	...	5 24	45.9	...	0 39	6		
4.325	—	5 23	50.3	...	0 21	48		
5.347	...	5 23	19.9	...	0 12	12		

COMET 1915a (MELLISH).—Some measurements of the additional nuclei of Mellish's comet (1915a) have been made by Mr. Knox Shaw (Helwân Observatory Bulletin, No. 16). The nuclei were situated on a bright ray in the tail, the one more distant from the head

being the brighter, and in the later stages appeared to be subdividing. During May these extra nuclei receded from the head with daily motions of about 1000 km.

THE SPECTRUM OF THE BINARY SYSTEM 41 ERIDANI.—In Bulletin No. 274, Lick Observatory, Dr. G. F. Paddock investigates the question of spectroscopic orbit formulæ, especially considering the derivation of elements of nearly circular orbits, and the reduction in cases where spectra of both components are available. In the first case, he improves the determination of position and epoch of periastron, and in the second enables the reduction of the double measures to be carried on as one operation instead of using them to obtain two symmetrical solutions. The new formulæ have been put in use in a study of the spectroscopic binary 41 Eridani (mag. 3.9, Sp. B9A). Briefest reference only can be made to some of the many important questions dealt with. A definite value is adopted for the wave-length of the magnesium line—4481.400 Å., or 4481.230 I.Å., and the variations of wave-length of this line alone are employed in deducing the orbit. All the thirty-nine spectrograms employed show it as a double line due to the two component spectra. The system proves to be one of normal values, although accurate photometric measures are yet required to fix the inclination of the orbit-plane. Measured wave-lengths are given for fifty lines (K to H β) and origins discussed. The lines are stated to be not so sharp as in Sirius, and distinctly fainter. A noteworthy feature is the number of proto-Mn lines represented. Intensities are merely verbally described. Two notes on the table of wave-lengths call for special remark. First, Mr. F. E. Baxandall, in 1914, published several new enhanced lines of Mn, including one at λ 4282.65. This origin will account for the line at λ 4282.7. Secondly, the line λ 4416.9, although masked in spark spectra, was shown by Prof. A. Fowler to be an enhanced line of iron, and provided a recognised origin for the stellar line. These points only emphasise the conclusion that 41 Eridani has an essentially enhanced line spectrum.

THE CONSTANTS OF THE TERRESTRIAL SPHEROID.—The Paris Conference (1911) adopted Hayford's values for the equatorial radius and aplatissement. Since then Helmert has derived a new value for the radius, and S. Wellisch suggests that Hayford's and Helmert's results should be combined. Instead of taking the adopted Hayford values he proposes that the mean be taken of three sets of values based on different assumed depths of the isostatic compensation layer (162.2 km., 120.9 km., and 113.7 km.). Taking Helmert's values with weight=unity, and the modified Hayford values with weight=4, he obtains for the equatorial radius=6,378,372 metres, excess over polar radius=21,476 metres, whence the reciprocal of the aplatissement=297. The length of the "metre" derived from these values is 1.00022632 metres (*Astronomische Nachrichten*, 4822).

SCIENCE AT EDUCATIONAL CONFERENCES.

"WHAT difference has the war made? I believe it has opened the eyes of the nation to the perils which arise from the neglect of intellectual things, the satisfaction with book knowledge, the inattention to facts, the concentration on physical prowess, and on a passive kind of material prosperity—the widespread ignorance of natural facts even among our leaders, and consequent contempt for investigation and expert knowledge. What has become apparent is the ignorance of our governing classes. The ignorance of all classes. The facts that education has not

led to widely diffused knowledge, was not designed to lead there, that it failed to stimulate any healthy intellectual interest in the majority, have now glared at us too prominently to be overlooked."

The above is an extract from the inaugural address which Sir Oliver Lodge delivered at the opening of the fourth annual Conference of Educational Associations. The audience was large—it was drawn from thirty educational societies—and the address was the precursor of strenuous activity displayed during the week by the great majority of the societies. It is not without significance that the representative committee which organised the conference should have sought a leader from the ranks of scientific workers, in an hour so fateful to the education of the nation. For this year there has been no question as to the desirability of holding educational conferences; the lessons of the war having intensified among teachers of all grades their sense of the national responsibilities of their work. Whether the same recognition of the inevitable consequences of training (or lack of training) in school has been reached by the public, is doubtful. There is only too good ground for Sir Oliver Lodge's warning to parents:—"Conservatism is natural in education. We have been through a certain mill, and we think it proper that our children should go through the same process. If a great school were subjected to sweeping reforms, a whole generation of fathers and grandfathers would feel themselves defrauded of the right of basking again in the queer, half-forgotten traditions of their boyhood." Our readers may recollect that the headmaster of one of our greatest public schools has declared that any extension of science in the school was impeded by the indifference, or even opposition, of the parents.

The address passed from castigation of anti-scientific obscurantism to constructive suggestions for training the average fourth form boy, involving a cultivation of inventive faculty by a variety of enterprises sometimes requiring mechanism, facilities for genuine experimentation and subjective discoveries, for self-developed interests and actual experience of the workings of nature. The utmost importance should attach to elementary physiology, and hygienic details ought to be inculcated as part of the tradition of the race. These and other points were treated in the address in a manner absolutely in accord with the practice of our more progressive schools for many years past. But although to some present their restatement may have seemed superfluous, in reality Sir Oliver Lodge was doing a most useful service by backing the methods of our science teachers with the support of his acknowledged authority in the realm of science. How necessary such support is may be gauged by the fact that within three days the Board of Education actually circulated a suggestion to secondary-school authorities that economies should be effected by dropping laboratory work in schools and substituting lecture-demonstrations!

Prof. A. N. Whitehead treated the Mathematical Association to a brilliantly phrased address, and his concluding sentences may serve as a comment on the endeavour of the Board of Education to reduce the efficiency of science teaching:—"The race which does not value trained intelligence is doomed. To-day we maintain ourselves. To-morrow science will have moved forward yet one more step, and there will then be no appeal from the judgment which will be pronounced on the uneducated." Prof. Whitehead fell foul of external examinations, and put a broad view of the task of mathematical teachers, defining mathematics as the science of life. The impression conveyed to at least one of his hearers was that this concept of mathematics should inspire both teacher and taught, the proper attitude being induced in the learner by

giving him problems which deal with things which really matter in the big world.

The pervading sense of national responsibility was perhaps most intense at the meeting of the Public Schools Science Masters, who met, as did also the Mathematical Association, at the London Day Training College. The president, Sir William Osler, gave "The Fateful Years, Fifteen to Seventeen," as the title of his address, the main feature of which was a plea that the schools should give intending medical students such a training in physics, chemistry, and biology that they may enter at once upon their purely medical studies as soon as they enter the university. The address, which had much literary charm as well as common-sense merit, was well received, the general feeling of the members being clearly in accord with their president. It was pointed out, however, that the real obstacle to the plan suggested was the faulty regulations of the University in which Sir William Osler is Regius professor. The schools tend to send their best boys to Cambridge and London, because Oxford will not allow the medical course to begin at once. From the discussion it appears that the would-be medical student enters in October, is compelled to wait until December before he is allowed to pass "Divinners," and has then to wait until the next medical course opens in the following October. The irony of the situation is heightened by the fact that the university has just sent an appeal to the headmasters on the lines of Sir W. Osler's request to the science masters. The situation would be humorous at another time; but at the present moment it is of the most obvious importance that every encouragement should be given to aspirants to a medical degree, and that every hindrance to rapid and thorough qualification should be removed. The discussion will, it may be expected, cause the rescission of the offending regulation.

Like most of the work of the meeting, the next paper dealt with a topic of immediate national concern, viz., the improvement of agriculture. With a force derived from unrivalled knowledge, Mr. Christopher Turnor dealt with the desirability of giving a bias towards agriculture in the science teaching, pointing out the need for arousing interest in the minds of those landowners of the future who are at present in the public schools. He effectively contrasted the interest and energy shown by the leaders of Denmark with the state of affairs in England. England is the only country in which the agricultural population has *absolutely* declined. The present writer was reminded of a remark made to him four years ago by a Swedish professor:—"You have a wonderful country. England will be a garden, *when you have developed your agriculture.*" A whole morning was given to a discussion on war work in schools, which was so practical and informative that its publication appears to be contrary to the interests of the various institutions concerned. Instructors from Woolwich and the War Office each testified to the value of the help which science masters are giving, especially by giving future officers instruction which will be immediately useful in active service. The members of the association, and especially Mr. C. L. Bryant, who, as honorary secretary, is the intermediary between the War Office and the science masters, may be congratulated on the work they are doing in this connection.

There was a discussion on school museums, as to which it is hoped to say more in a future article. The same remark applies to various discussions at different societies, also to the exhibitions; the present article being restricted to those problems of science instruction which directly influence national affairs. It is satisfactory to record that a sub-committee, consisting of Messrs. Hill, Tripp, and Oldham, has been

appointed to report upon possible ways and means of furthering the claims of school science, and of raising it from its present position, in view of the fact that the status of science in the public schools has so important a relation to the recognition of science by the nation's leaders.

The Association of Teachers in Technical Institutions arranged a discussion on "Technical Education: the War and After," which formed part of the great conference at the University of London. The attendance was relatively small; a fact quite creditable to the Association, as the absentees were all engaged on technical work of value and urgency in connection with the war. Nevertheless the quality of the papers and speeches evoked justified the organisers of the meeting—they will be read both in England and abroad in the general report of the Conference. Mr. Barker North (Bradford Technical College) reviewed the situation, laying emphasis on the necessity for maintaining the efficiency of technical institutions if we wish to succeed in the coming industrial war. He advocated more central organisation, not only in instruction and research, but also in commerce and industry. Referring to the Board of Education, he reiterated Mr. Abbott's warning that any diminution in expenditure which interferes with the efficiency of technical education will handicap the nation in the coming industrial struggle.

Mr. James Baker vividly sketched the contrast between England, with miserably limited technical departments and slum-infected cities, and Bohemia, with splendid scientific institutions, rapidly advancing industries, and consequent abolition of poverty. Incidentally he referred to the high state of general culture and enlightenment in Bohemia, where the people wish to be on England's side in the war.

Dr. C. Doré considered the possibilities of industrial research work in technical institutions. The remarkable applications of science in the war have opened the eyes of manufacturers, and many firms for the first time have employed a chemist. What is more, they have admitted that scientific methods pay better, and that Government specifications are passed more easily with a chemist than without one. Those firms are not likely to do without such trained assistance in the future. Seeing that instruction must form a large part of the work of technical institutions, it is recommended that a director of research should find out problems, obtain material, and apportion the work among the institutes according to their capacity. Such centrally directed work is now being carried out in making drugs, and is quite successful.

The Science Teachers' Association also held a successful meeting, the description of which must be deferred. Efforts to broaden the membership and widen the work of this society are being considered. The Council of the Association will do well to throw its energies at once into the work of expansion.

The striking vigour and success of the whole Conference of Associations demonstrate that teachers are alive to the national position. Their united efforts are needed to make clear to the public, and to persons in high authority, that upon education, and especially on scientific education, depends our progress towards a wiser England.

G. F. DANIELL.

PRIZE AWARDS OF THE PARIS ACADEMY OF SCIENCES, 1915.

Mathematics.—The Francœur prize is awarded to Joseph Marty for his work on the theory of integral equations. The Bordin prize is postponed to 1916.

Mechanics.—No award was made of the Montyon prize; the Poncelet prize is accorded to Charles Rabut,

for his work as a whole; Umberto Puppini receives the Boileau prize, for his work in hydraulics.

Astronomy.—The Lalande prize to Lucien d'Azambuja, for his important contribution to the daily measurement of the upper layer of the solar atmosphere and to the recognition of the action exercised by the magnetic field on band spectra; the Valz prize to Armand Lambert, for his work as an observer and in applied mathematics; the G. de Pontécoulant prize to Louis Fabry, for his researches on the asteroids; no award of the Pierre Guzman prize is made.

Geography.—The Tchihatchef prize to J. Couyat-Barthoux, for his geological and geographical work on the Sinai and Suez Canal regions; the Gay prize to Henri Lecomte, for his studies on the distribution of plants in Indo-China.

Navigation.—The Extraordinary prize of 6000 francs is divided between Maurice Marchand (3000 francs), for his memoir on the protection of the submarine against mines, Jean Lorfèvre (1500 francs), for his essay on the use of Diesel motors, and Louis Jauch and Auguste Masméjean (1500 francs jointly), for their work on marine engines; the Plumey prize is not awarded.

Physics.—The Hebert prize to Michael Idvorsky Pupin, for the whole of his work in applied electricity; the Hughes prize to R. Marcelin, for his theoretical and experimental memoir entitled "Contribution to the Study of Physico-Chemical Kinetics"; the H. de Parville prize to Jean Blein, for his contributions to the thermodynamics of gases and detectors in wireless telegraphy; the Gaston Planté prize to Marcel Moulin, for his researches on the positive rays of radium, ionisation, radiation of black bodies, and other interesting questions of modern physics; the Pierson-Perrin prize to Maurice de Broglie, for his studies on ionised gases, the Brownian movement, and the diffraction of the X-rays.

Chemistry.—The Jecker prize to Gabriel Bertrand, for his work in organic and biological chemistry; the Cahours prize to Paul Viguier, for his researches on tetrolic aldehyde and some of its derivatives; the Montyon prize (unhealthy trades) to André Kling (2500 francs), for his work in the Paris Municipal Laboratory; honourable mentions (1500 francs), to Daniel Florentin and René Schmutz (1000 francs); the Houzeau prize to Paul Pascal, for the whole of his work in inorganic and organic chemistry.

Mineralogy and Geology.—The Delesse prize to Albert de Romeu, for his petrographic researches, and an encouragement (1000 francs) to A. Laville, for his researches on fossil vertebrates; the Joseph Labbé prize to René Tronquoy, for his studies on tin ore deposits; the Victor Raulin prize to Louis Doncieux, for his palæontological researches; no award of the Cuvier prize is made, and the funds will be used for charitable purposes.

Botany.—The Desmazières prize to Giovanni Battista de Toni and Achille Forti, for their contributions to the Mediterranean algological flora; the Montagne prize to Fernand Camus; the de Coigny prize to Pierre Choux, for the whole of his botanical work; the Thore prize to Isidore Doin; the de Ruzf de Lavison prize to Paul Becquerel, for his researches on the life of seeds.

Anatomy and Zoology.—The Savigny prize to Pierre Fauvel, for his researches on annelids obtained in the voyages of the *Hirondelle* and the *Princess Alice*; the da Gama Machado prize is not awarded.

Medicine and Surgery.—Montyon prizes: A prize of 2500 francs to François Maignon, for his researches on the toxicity of albumenoid materials; an honourable mention of 1500 francs to Emile Terroine, for his work on pancreatic secretion; citations to Eugène Olivier and Dr. Ginestoux; the Barbier prize to Charles Dassonville and Cléry Rivière, for their memoir on epizootic abortion in mares; very honourable mentions to Charles Besnoit and V. Robin, for their works on cutaneous sarcosporidiosis of the ox,